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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : B29C 49/54, 49/48, 49/18, B65D 1/02 | A1

(11) International Publication Number: WO 99/52701

(43) International Publication Date: 21 October 1999 (21.10.99)

(21) International Application Number: PCT/US99/06971

(22) International Filing Date: 30 March 1999 (30.03.99)

(30) Priority Data:
09/058,372 9 April 1998 (09.04.98) US

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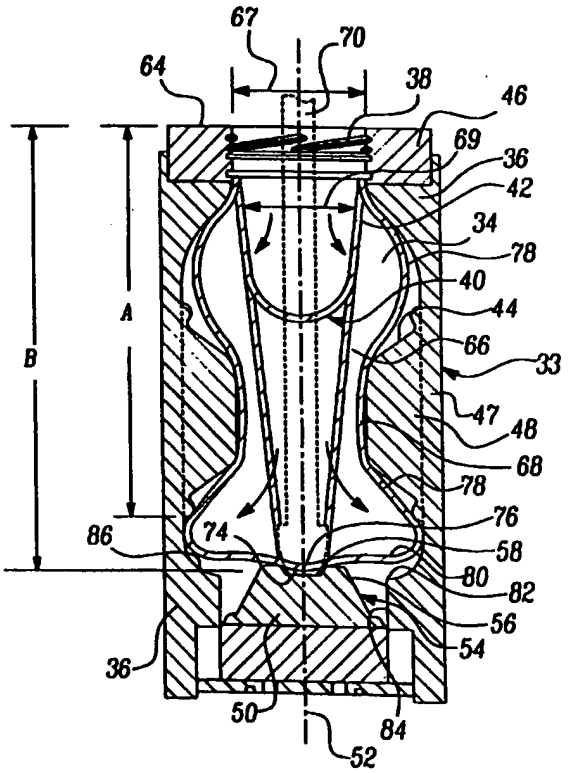
(81) Designated States: BR, CA, MX, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: METHOD OF FORMING WIDE-MOUTH, HEAT-SET, PINCH-GRIP CONTAINERS

(57) Abstract

A wide-mouth, hot-fill plastic container (10) having pinch-grips (14) and a high push-up base (24) and method for forming the same. According to the method, a preform (40) is positioned in a mold cavity (34) defined in part by surfaces which deviate substantially inward to form pinch-grips (14) in the resulting container (10). Initially, a mold base (50) is located so that it defines an initial mold cavity (34) whose length is greater than the final length of the container (10). The preform (40) is axially stretched in the cavity to a length greater than the container's final length. After stretching the preform (10), the preform is generally expanded radially outward under low pressure. The mold bottom (50) is then moved to a position where the length of the cavity (34) is about the same as the final length of the container (10). The preform (40) is further expanded under high pressure such that it contacts the molding halves (36) thereby forming the finished container (10). As a result of the above method, the base and contact ring of the container (10) is fully circumferentially formed below the pinch-grips (14). The container (10) is also heat treated to allow for filling with a hot product.



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METHOD OF FORMING WIDE-MOUTH, HEAT-SET, PINCH-GRIP CONTAINERS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to methods for forming plastic containers. More specifically, the present invention relates to a method for forming a wide-mouth, heat-set plastic container having pinch-grips and a high push-up base.

2. Description of the Prior Art

As containers made of polyethylene terephthalate (PET), or other plastic resins which are capable of being used in hot-fill applications, become more widespread, there is a need to develop these hot-fill containers so as to be suitable for an ever wider variety of product applications.

In general, heat-set or hot-fill containers are those plastic containers capable of receiving a product therein while the product is at an elevated temperature, without any resulting deformation in the container. Containers of this variety are used in those situations where the product needs to be sterilized, pasteurized or otherwise heat treated prior to filling. Upon the introduction of the hot product into the container, if the container is not of a hot-fill variety, stresses in the material forming the container will cause the container to deform into an unacceptable end product. To be considered a hot-fill container, containers must be capable of withstanding filling temperatures of at least 150° F and more typically 160° - 180° F.

In forming a hot-fill container, PET or another suitable plastic resin is initially formed into a preform. This is most often done by an injecting molding method. Preforms all have a protypical structure which includes a mouth and a generally tubular body that terminates in a closed, typically rounded, end. Prior to being formed into containers, preforms in a softened state are transferred into a mold cavity configured in the shape of the desired container. Once in the mold cavity, the preforms are blow molded or stretch-blow molded into the desired container.

During the blow molding process, the plastic material is stretched and expanded so as to introduce an orientation (on the molecular level) into the material. The amount and location of orientation imparts various mechanical properties to the container. Generally, the higher the orientation, the less the container is capable of withstanding hot-fill temperatures. To increase the hot-fill capabilities of these oriented containers, the containers must be subsequently heat treated. The heat treatment, which can be one of several well known methods, increases the crystallinity of the material forming the container and this results in an increase in the container's thermal capabilities.

As hot-fill containers have evolved, various features have been found to increase the

performance capabilities of the containers while other features have been found to enhance the usability of the containers. For example, from the performance side, hot-fill containers having deep or high push-up bases into the container cavity have been found to exhibit good mechanical and thermal properties in the base region. Specifically, the high push-up base helps to reduce the bottom roll-out which can occur after hot-filling and capping of the container. As the phrase is used herein, "high push-up base" is meant to include a base which has a domed portion that extends inwardly into the container to a height, generally measured on the exterior of the container from the contact ring of the base to the apex of the dome on the interior of the container's cavity, greater than approximately 3/8 inch and more typically 1/2 inch.

Another example of desired features in a hot-fill container are pinch-grips in the container's sidewall for easy grasping of the container.

Another desired feature for a hot-fill container is the incorporation of a large or wide-mouth into the container. Wide-mouth containers enable use of a spoon or other utensil to remove products, such as applesauce, from the container. As used herein, a wide-mouth container is generally defined as a container whose mouth has an outer diameter which is greater than approximately one-third of the outer diameter of the finished container or a mouth whose outer diameter is greater than approximately 1.5 inches.

While seen individually, the above features have not been heretofore incorporated together. As such, the novel container of the present invention may be referred to as a wide-mouth, high push-up, pinch-grip, heat-set container.

In attempting to blow molding of the aforementioned novel container, processing difficulties were encountered. These difficulties were of such a nature that no acceptable containers were formed until an equally novel method of molding the containers was developed by the present inventors.

The difficulty encountered in forming the containers was unexpectedly the result of the combination of the wide-mouth, wide body of the preform, a high push-up and the pinch-grips in the resultant container's sidewalls. The substantial indentations defining the pinch-grips in the mold were found to prevent the full formation of the base and chime areas, immediately below the pinch-grips, when a high push-up base was incorporated. It has been determined that this deficiency results from the plastic material expanding radially outward and axially downward to a point where it engages the indentations of the mold that define the pinch-grips. This contact occurs relatively early in the molding process and well before the material has been fully expanded downward onto the base and into the chime region. Once the material contacts the indentations, the material at least partially freezes and is thus restricted from being blown further down onto the base and into the chime region of the container. In addition to contact with the indentations of the mold, the material contacts the high push-up of the base

mold before full expansion. This further restricts the material from being fully formed into the chime region. With less material being available for forming the base and chime regions, an incomplete or a non-uniform base was found to result. This leads to a functionally and aesthetically unacceptable container.

If a flat or a "low" push-up base is used, the inventors have found that the above difficulties mentioned above are not encountered. This is believed not to occur because the material does not contact the base mold until later in the molding process. However, as indicated earlier, a container with no or a low push-up base does not have optimum performance characteristics needed for hot-fill applications.

In view of the foregoing, it should be apparent that there exists a need for an improved wide-mouth container having pinch-grips and which is suitable for hot-fill applications. Equally, a need exists for a method of making such a container.

It is therefore a primary object of this invention to fulfill that need by providing a wide-mouth, high push-up, pinch-grip, heat-set container and a method for making such a container.

A further object of this invention is to provide a manufacturing method wherein such containers have a uniform and fully developed base.

SUMMARY OF THE INVENTION

Briefly described, these and other objects are accomplished according to the present invention by providing a heat-set container and method for forming a wide-mouth, pinch-grip container with a high push-up base. According to the method of the present invention, a preform having an already formed wide-mouth, is positioned in a mold cavity whose surfaces define the final shape of the desired container. The mold portions which define the container's sidewall include substantial inward deviations which will cause the pinch-grips of the resulting container to be deformed. The high push-up base of the container is defined by a base mold which is separate from the sidewall portions of the mold. Initially, the base mold is positioned so that it defines an initial mold cavity whose length is greater than the final length of the desired container. During molding, the preform is axially stretched or expanded to a length which is also greater than the length of the final container or cavity. During or after stretching of the preform, pressurized air is introduced into the container causing a partial pressurization of the preform which begins expanding the preform radially outward. Additionally, the mold bottom is moved in the direction of the preform's mouth, from an initial position into a final position. The final length of the cavity or container is defined from the mouth of the exterior surface of the base's apex. The preform is then fully expanded into contact with the mold surfaces to form the finished container.

Since the material which subsequently forms the base and chime area is radially expanded after the preform has been axially over-stretched, sufficient material will have been

moved into the area below the pinch-grip indentations and laterally outward from the high push-up base mold allowing complete formation of the base and chime regions of the container directly below the pinch-grips. As a result of the above method, the base of the container is fully formed below the pinch-grips and an aesthetically and mechanically acceptable wide-mouth, high push-up, pinch-grip container is produced, which upon proper heat treating is capable of receiving a hot-fill product.

Additional benefits and advantages of the present invention will become apparent to those skilled in the art to which the present invention relates from the subsequent description of the preferred embodiment and the appended claims, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a container according to the present invention;

FIG. 2 is a cross-sectional view, taken generally along line 2-2 in FIG. 1, illustrating the fully formed base of the container;

FIG. 3 is a side elevational view of an unacceptably formed container;

FIG. 4 is a cross-sectional view of a mold illustrating a stretch rod and preform during initial molding according to one aspect of the present invention, with the base mold in its initial position and the preform being axially over-stretched; and

FIG. 5 is a cross-sectional view, similar to that of FIG. 4, during final molding of the container and showing the base mold having been moved into its final position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in detail to the drawings, best seen in FIGS. 1 and 2 is a container 10 according to the present invention. The container 10 includes a wide-mouth 12 that merges into a generally rectangular or cylindrical sidewall 13 (rectangular being illustrated) that in turn merges into a base 16 which closes off the bottom of the container 10.

Formed on opposite sides of the sidewall 13 are a pair of pinch-grips 14. The pinch-grips 14 themselves represent substantial deviations into the container 10 and allow for easy gripping of the container 10, between the thumb and forefinger of one hand.

The base 16 of the container 10 has defined therein a uniform, contact ring 18 that circumscribes a high push-up 24. As seen in FIG. 2, the push-up 24 is generally dome shaped, protruding toward the interior of the container 10, with an inner wall 26 inclining upward toward an apex 22 generally defining the center of the base 16 and which is intersected by a longitudinal axis 23 through the container 10. The apex 22 of the container 10 further defines a nominal length A, measured between the exterior or bottom surface of the apex 22 and the rim 20 defining the mouth 12.

As mentioned previously, in developing the container 10 of this invention, processing problems which were encountered were heretofore unappreciated since the container 10 itself was not previously known. A major problem encountered by the present inventors was that when attempting to form the container 10 seen in FIGS. 1 and 2 by conventional methods, the resulting container had a non-uniform or incompletely formed base. Such a container 10' is seen in FIG. 3. The incomplete base 18' of the container 10' exhibited upward depressions or recesses 28, directly below the pinch-grips 14'. Such recesses 28 were unacceptable from both a functional and aesthetic standpoint. After significant analysis and the molding of containers with low push-ups, it was determined that the recesses 28 were a result of the preform material freezing against the protruding portions 48 and 54 of the mold 33 which define pinch-grips 14' and the push-up, this freezing occurring before an adequate amount of material had been blown or moved into the region below the protruding portion 48 and between the protruding portions 48 and 54. The recesses 28 further exhibited a downward tapering surface 30, extending to the contact ring 18' of the base 16'. This surface 30 was believed to be tapered because the depth of the protrusions 48 defining the pinch-grips 14' decrease in the lateral direction, allowing more material to move into the area between the protruding portions 48 and 54, supporting the present inventor's conclusions as to the cause of the recesses 28 themselves.

Seen in FIGS. 4 and 5, the mold 33 includes surfaces defining a mold cavity 34 for forming the container 10 of the present invention. As further described below, the mold 33 includes additional features which enable the formation of the container 10 without the recesses 28' seen on the incomplete container 10' of FIG. 3.

The mold cavity 34 is defined by a pair of mold halves 36 that close upon one another to engage and retain the threaded neck finish 38 of a preform 40 therebetween. When retained in this manner, the body 42 of the preform 40 is suspended within the mold cavity 34. Each mold half 36 includes finish defining portions 46 and body defining portions 47, the latter of which include the pinch-grip defining protruding portions 48 as substantial deviations into the cavity 34.

The base 16 of the container 10 is defined in part by the body defining portions 47 and in part by the base mold 50. The base mold 50 includes a protruding portion, having a bottom molding surface 54, that causes formation of the push-up 24 in the finished container 10. Complimentary to the push-up 24, the bottom molding surface 54 is generally dome shaped with an inner wall 56 inclining upward toward an apex 58. To overcome the problems discussed above, the base mold 50 is constructed to be axially movable from an initial or first position (shown in FIG. 4) to a final or second position (shown in FIG. 5) during the blow molding method of the present invention. The initial position defines the initial configuration of the mold cavity 34 such that an initial length B is defined between the top 64 of the neck ring

46, which engages the neck finish 38, and the apex 58 of the base mold 50. The final position of the base mold 50 accordingly defines the shorter length A, mentioned above relative to the container 10, which corresponds to the length between the top 64 of the neck ring 46 and the apex 58.

In molding the container 10 of the present invention, the first step of this inventive method is to provide a wide-mouth preform 40 which can be stretched and blown into the finished container 10. FIG. 4 includes a representation of the various stages through which the preform 40 progresses during the blow molding process of the present invention. The un-stretched preform 40, an over-stretched preform 66, and a partially blown container 68 are all illustratively shown in FIG. 4. The preform 40 is for a wide-mouth container and can be seen to have a mouth 38 with a diameter 67 that is generally larger than the average diameter 69 of its body 42. In a stretchable condition, the preform 40 is positioned in the neck ring 46 so that its body 42 is suspended within the mold cavity 34.

With the base mold 50 retracted (its initial position), a stretch rod 70, or other means to axially stretch the preform, is positioned within the preform 40 and advanced along an axis corresponding to the axis 52 of the container 10. In this manner the unstretched preform 40 is axially stretched to form an over-stretched preform 66 with a length greater than A and approximately equal to B. The stretch rod 70 may be fully advanced so that it clamps a closed end 76 of the over-stretched preform 66 between an end 74 of the stretch rod 70 and the apex 58 of the base mold 50 while the mold base 50 is either in its initial position or in an intermediate position between the initial and final positions. The need for and timing of the clamping of the preform between the stretch rod 70 and base 50 will vary depending on the exact design characteristics, including weight, of the particular container 10 being molded. FIG. 4 can accordingly be viewed as representing the base mold 50 in either its initial position or the intermediate position.

A blow medium, such as air, at a predetermined pressure is introduced into the cavity 34 to initially expand the preform 66 radially outward. The blow medium can be initiated during the over-stretching step or immediately after the completion of the over-stretching step. The exact timing of the introduction of the blow medium will be dependent on the specific design characteristics of the desired container.

With the base mold 50 is in its initial position, the bottom molding surface 54 is spaced farther away from the protruding portions 48 than when the base mold 50 is in its final position. Because of the enlarged gap between bottom molding surface 54 and the protruding portions 48, the bottom most portions of the over-stretched preform 66 are free to be expanded or moved radially outward and generally fully into the chime defining area 82 of the mold 33, particularly directly beneath the indentations 48, without being restricted by early freezing of the plastic material.

Following a predetermined amount of time for the blowing medium to expand the stretched preform 66 into the partially blown container 68, the base mold 50 is then moved into its final position. During this movement, the stretch rod 70 is retracted at a rate corresponding to advancement of the base mold 50. This ensures that the end 76 of the over-stretched preform 66 is and remains clamped against the base mold 50, preventing shifting or movement of the over-stretched preform 66 and the formation of an unacceptable container. The timing delay between the first blowing process and the moving of the mold base 50 is critical to the success of the process and full formation of the container 10. If the delay is too great, too much material may be blown outward and material may actually freeze in the pathway 84 that allows for movement of the base mold 50. On the other hand, if the base mold 50 is moved too early, an insufficient amount of material will be moved into the base 86 and chime 82 defining areas of the mold cavity 34, resulting in the recess 28' mentioned above. It has been found that in order to properly form a 48 ounce, square wide-mouthed container 10 with a high push-up 24 and pinch-grips 14 requires the blow medium to be applied for approximately 0.55 seconds, after over-stretching and before movement of the base mold 50. Obviously, the appropriate timing prior to the movement of the base mold 50 will be dictated by the actual design characteristics of the particular container and will accordingly vary.

After blowing the material into the base and chime area, the next step in the molding process is to blow the preform 40 into substantial conformity with the mold cavity 34. This is done preferably after the base mold 50 has been moved into its final position 62 and the mold cavity 34 is in its final molding configuration. However, it may be initiated prior to the base mold 50 actually reaching that final position if sufficient material has been moved into the base/chime area. The result of the application of the latter pressure is generally shown in FIG. 5. In that figure, the sidewalls 13 and base 16 of the fully blown container 10 are seen as being fully expanded so that they substantially conform with the side molding surfaces 44, 54 of the mold halves 36 and the base mold 50. As used herein, "substantial conformity" means conformity sufficient to produce an acceptable resultant container. During this latter application of blowing medium, the stretch rod 70 continues to clamp a portion, the apex 22, of the blown container 10 between the end 74 of the stretch rod 70 and the apex 58 of the base mold 50. At this point, the fully blown container 10 has a final length A, measured from the rim 20 of the mouth 12 to the apex 22 of the base 16. If desired, venting of the blow medium can be accomplished through the stretch rod 70 for added cooling.

Alternatively, the blowing medium can be provided at a constant pressure or at different pressures during the molding cycle. For example, during axial stretching of the preform 40, the blowing medium may be provided at a pressure which is less than the pressure applied when the preform 40 is blown into substantial conformity with the surfaces defining the final configuration of the mold cavity. The lower pressure may be ambient or greater than ambient

but less than the subsequent "high" pressure.

The final steps of the present method are the opening of the mold halves 36 and the retraction of the base mold 50 allowing for removal of the finished container 10 from the mold cavity 34. The container 10 produced by the present method has a completely formed push-up 24 and a continuous circumferential contact ring 18, particularly directly beneath the pinch-grips 14. The blown container 10 is then be heat treated according to conventional methods to permit its use in hot-fill applications.

While the above description constitutes the preferred embodiment of the present invention, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope and fair meaning of the accompanying claims.

CLAIMS

1. A method of forming a wide-mouth plastic container with a pinch-grip and a high push-up base, a container length "A" being defined from the rim of the wide-mouth to an apex of the high push-up base, said method comprising the steps of:

providing a preform having a generally tubular body, a neck finish and a mouth defined at one end of said body and a closed end at an opposing end of said body;

positioning said preform with a mold cavity defined in part by a pair of mold halves, said mold halves including portions forming substantial protrusions into said cavity for forming pinch-grips into a sidewall of a resultant container, said mold cavity also being defined in part by a base mold, said base molds including a bottom molding surface for forming a push-up base with an apex generally located along a longitudinal axis through said cavity;

positioning said base mold in a first position such that said mold cavity has an initial length "B" being greater than said container length "A";

axially stretching said preform within said cavity to an over-stretched length which is greater than the container length "A";

moving said base mold into a second position such that said cavity has a final length "B" which is less than said initial length "A";

introducing a blowing medium into said preform to expand said preform into at least substantial conformity with said mold halves and said base mold and so as to fully form an area of said resultant container immediately beneath the pinch-grips thereof; and

removing said container from said mold cavity.

2. The method of Claim 1 wherein said axial stretching step utilizes a stretch rod to stretch said preform.

3. The method of Claim 1 further comprising the step of clamping said closed end of said preform between a stretch rod and said base mold.

4. The method of Claim 3 wherein said base mold is moved into said second position while said closed end of said preform is clamped between said stretch rod and said base mold.

5. The method of Claim 1 wherein the step of introducing said blowing medium involves providing said blowing medium at least two different pressures.

6. The method of Claim 5 wherein said blowing medium is first provided at a lower pressure and then provided at a higher pressure.

7. The method of Claim 6 wherein said lower pressure of said blowing medium is provided before said base has reached said final position.

8. The method of Claim 6 wherein said lower pressure of said blowing medium is provided before completion of said axial stretching step.

9. The method of Claim 6 wherein said higher pressure of said blowing medium is provided after said stretching step.

10. The method of Claim 6 wherein said higher pressure of said blowing medium is provided after initiation of movement of said base mold into said final position.

11. The method of Claim 1 wherein said blowing medium is provided at only one pressure.

12. A container produced by the method of Claim 1.

13. A method of operating a mold for forming a plastic container having pinch-grips in a sidewall thereof and a high push-up base, said method comprising the steps of:

providing a preform having a generally tubular body, portions of said preform defining a wide-mouth at one end and a closed end opposite said wide-mouth;

providing a mold for said container, said mold having a cavity defined by a pair of mold halves and a base mold, said mold halves including side molding surfaces in a shape corresponding to sidewalls of said container, said side molding surfaces each including protruding portions for forming substantial indentations into said sidewalls of said container formed therein, said base mold including a bottom molding surface protruding into said cavity for forming a high push-up base in said container;

positioning and retaining a preform in said mold with said body suspended within said cavity;

positioning said base mold in a first position relative to said mold halves such that a first distance is defined between said protruding portions of said mold halves and said bottom molding surface of said base mold;

axially stretching said preform to a position between said protruding portions and said bottom molding surface;

moving said mold base to a second position relative to said mold halves such that a second distance is defined between said protruding portions of said mold halves and said bottom molding surfaces of said base mold;

clamping said closed end of said preform against said mold base as said mold base is moved;

introducing a blowing medium internally of said preform to expand said preform into at least substantial conformity with said mold halves and said base mold to form said container with a complete circumferential contact ring;

opening said mold halves and retracting said mold base from said second position; and

removing said container from said mold.

14. The method of Claim 13 wherein said blowing medium is first introduced at a lower pressure and is then introduced at a higher pressure.

15. The method of Claim 14 wherein said introducing of said blowing medium at said lower pressure is performed after said stretching step.

16. The method of Claim 14 wherein said introducing of said blowing medium at said lower pressure is performed before initiation of movement of said mold base to said second position.

17. The method of Claim 14 wherein said introduction of said blowing medium at said higher pressure is preformed after initiating movement of said base mold to said second position.

18. The method of Claim 13 wherein said introducing of said blowing medium is done at one pressure.

19. The method of Claim 14 wherein said introducing of said blowing medium at said higher pressure is performed after said base mold has been moved into said second position.

20. The method of Claim 13 further comprising the step of using said base mold to form a high push-up in said container, said high push-up being at least 0.5 inches above said contact ring.

21. The method of Claim 13 wherein said mold halves are closed to define a neck finish receiving portion having a diameter greater than one-third of the diameter defined by said cavity.

22. A container produced by the method of Claim 13.

23. The method of Claim 13 wherein said step of clamping is performed over the entire range of motion of said base mold.

24. The method of Claim 13 wherein said step of clamping occurs after initiation of movement of said base mold.

25. The method of Claim 13 further comprising the step of moving an amount of material into an area between said protruding portions and said base mold after axial stretching of said preform and before movement of said base mold.

26. A unitary plastic container comprising a neck finish, a shoulder portion, a body portion and a base portion, said shoulder portion extending from said neck finish and connecting to said body portion extending from said shoulder portion, said base portion being connected to said body portion and closing off a bottom end of said container and said neck finish defining a mouth having a first diameter, said body portion defining a container width and said first diameter being at least one-third of said container width, said body portion including pinch-grips defined therein and forming substantial deviations into said container allowing said container to be gripped between the thumb and forefinger of one hand, said base portion including a high push-up extending interiorly of said container and circumscribed by a continuous contact ring.

27. The container set forth in Claim 26 wherein said container includes vacuum absorption panels.

28. The container set forth in Claim 26 wherein said container has a fluid product capacity of less than 64 fluid ounces.

29. The container set forth in Claim 26 wherein said push-up extends at least one-half inch above said contact ring.

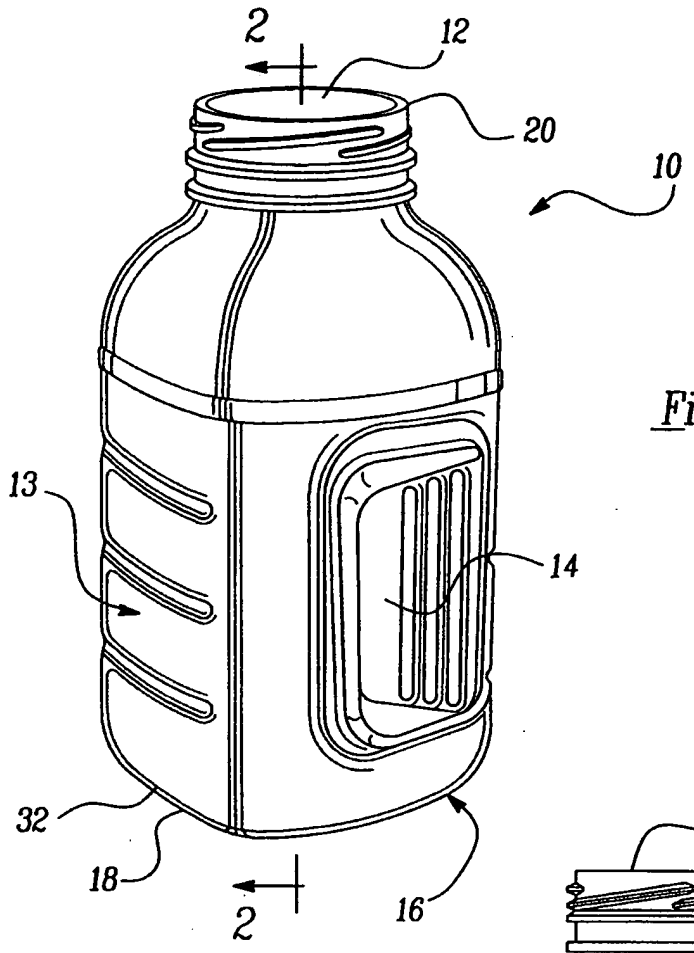

Fig-1

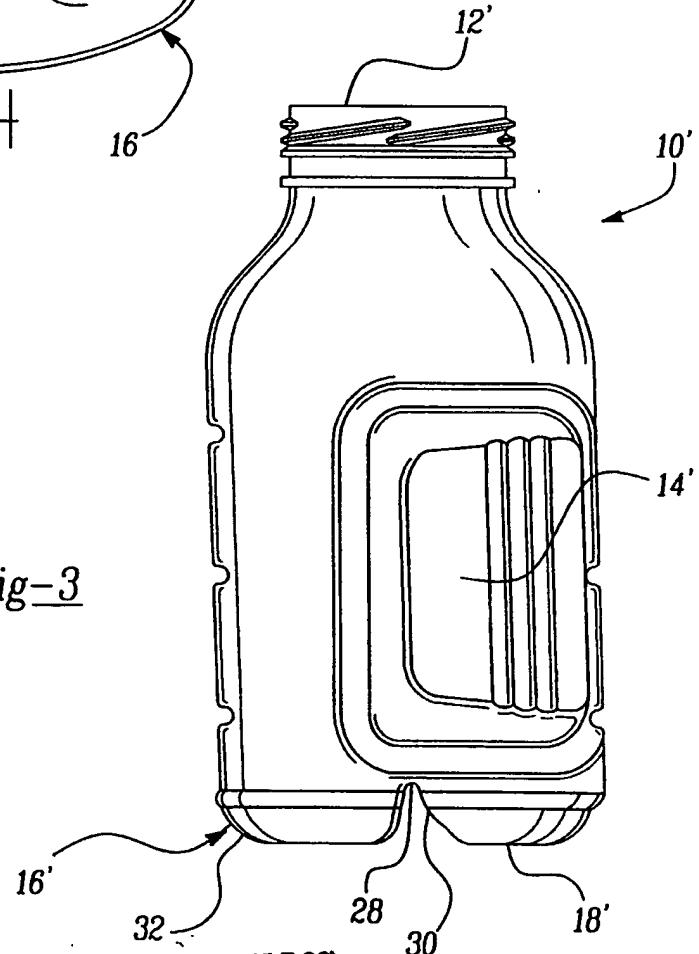

Fig-3

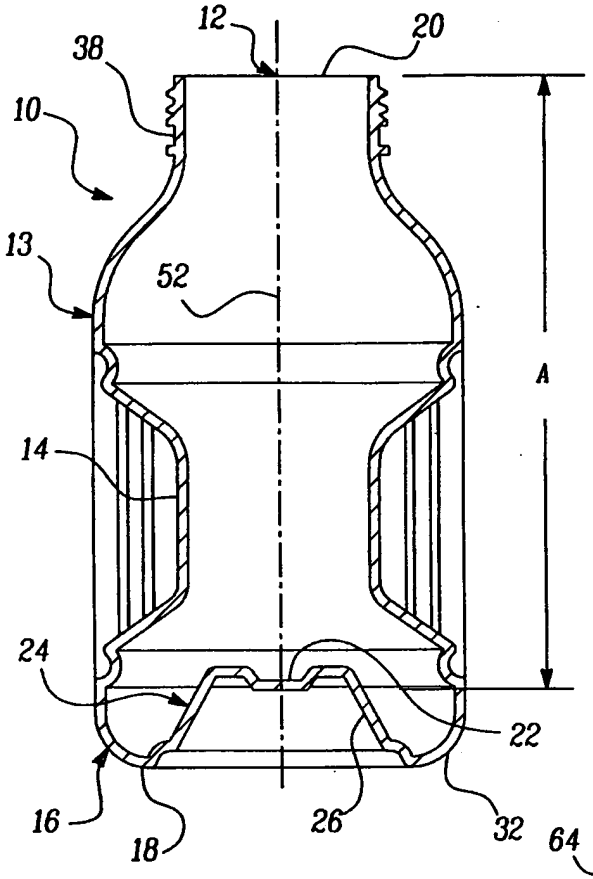
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Fig-2

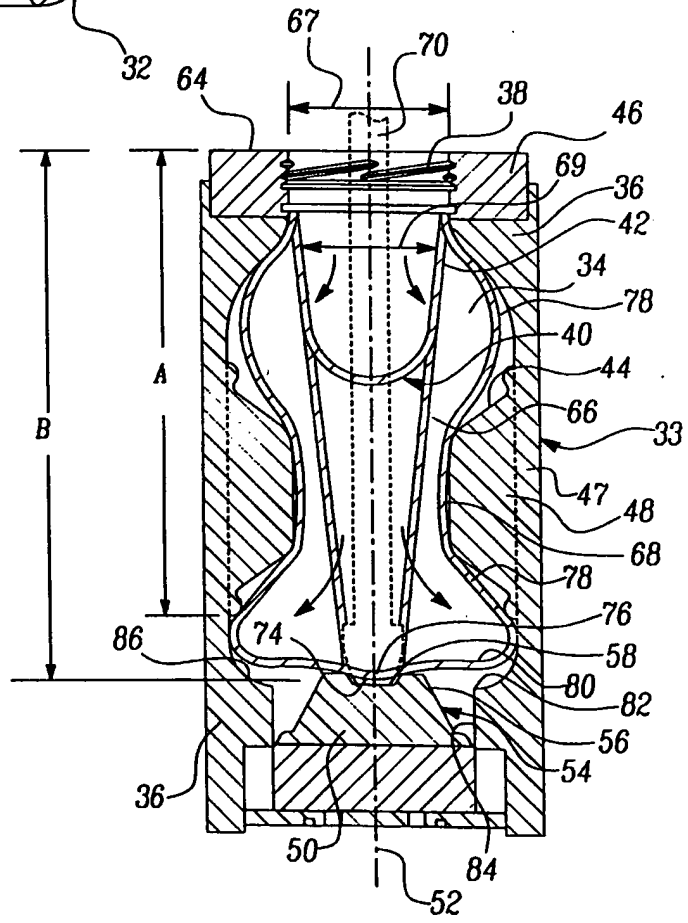
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Fig-4

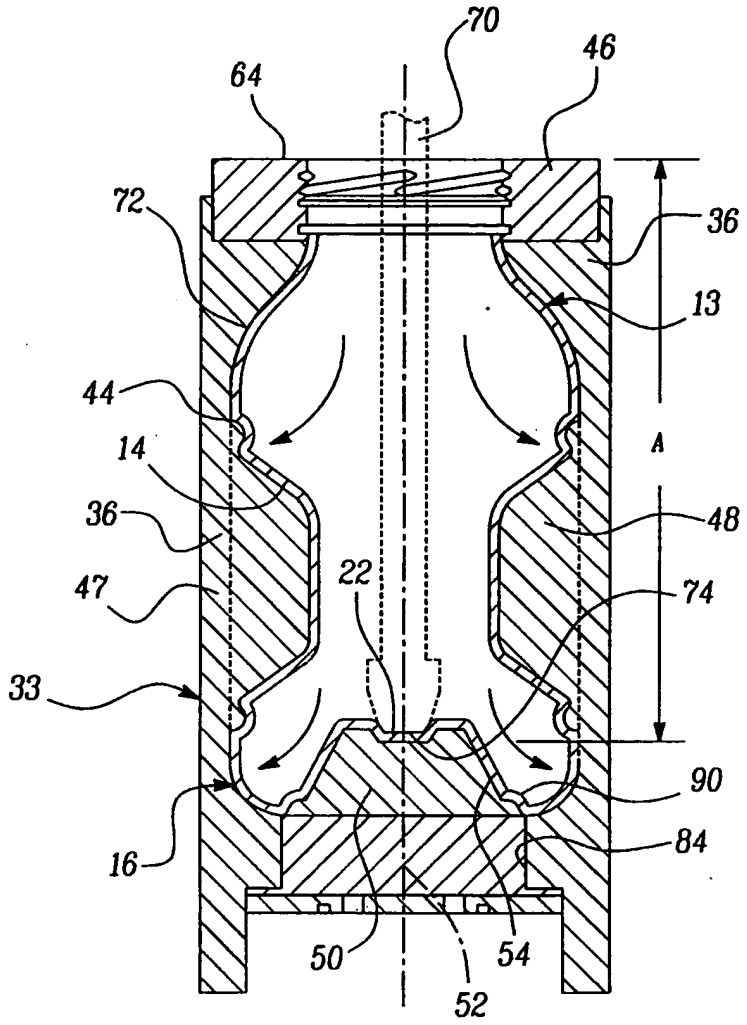

Fig-5

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 99/06971

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B29C49/54 B29C49/48 B29C49/18 B65D1/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B29C B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	GB 2 102 724 A (KATASHI AOKI) 9 February 1983 see page 4, line 56 - page 5, line 20; figures 5-8	1-4,11, 12 13,14, 20-26, 28,29
X	GB 2 137 921 A (PETAINER SA) 17 October 1984 see page 1, line 115 - page 3, line 3; figures	1-4, 11-14, 20-26, 28,29
A	EP 0 346 949 A (YOSHINO KOGYOSHO CO LTD) 20 December 1989 see claim 1; figures	1,12,13, 22,26

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 June 1999	06/07/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Kosicki, T

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
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